

Remarks

After entry of the present Amendment, claims 1-5, 7-11, 13-16, and 19-20 are pending in the present application. Due to the lengthy prosecution of the present Application, claims 1, 7, and 13 have been amended as part of this response to expedite prosecution. Specifically, claim 1 has been amended to incorporate claim 6 and an element from the specification. Claim 7 has been amended to incorporate claim 12 and an element from the specification. Claim 13 has been amended to incorporate claim 17 and an element from the specification. The amendments to claims 1, 7, and 13 are supported throughout the specification and the drawings and specifically at paragraphs [0023] and [0028] and Figures 4, 5, and 7. No new matter is being added. Claims 6, 12, and 17-18 have been cancelled as part of this response.

Claims 1-3, 5, and 6 stand rejected under 35 U.S.C. §102(b) as being anticipated by United States Patent No. 4,300,723 to *Prasthofer* (hereinafter referred to as *Prasthofer*). Claim 4 stands rejected under 35 U.S.C. §103(a) as being unpatentable over *Prasthofer*. Claims 1-20 stand rejected under 35 U.S.C. §103(a) as being unpatentable over United States Patent No. 6,139,913 to Van Steenkiste et al. (hereinafter referred to as *Van Steenkiste '913*) in view of *Prasthofer*.

Applicants respectfully traverse the rejection of claims 1-3, 5, and 6 under 35 U.S.C. §102(b). As the Examiner is well aware, to properly establish anticipation under 35 U.S.C. §102 the reference must teach each and every element of the rejected claim. *See MPEP 2131*. *Prasthofer* does not disclose each and every element of amended independent claim 1. As such *Prasthofer* does not anticipate amended independent claim 1 under 35 U.S.C. §102(b). Specifically, *Prasthofer* does not disclose the diverging region adjacent the throat having a cross-sectional expansion rate of at least 1.0 millimeters squared per millimeter wherein the portion is located within a first one third of a length of the diverging region adjacent to the throat and wherein the cross-sectional expansion rate decreases between the first one third and an exit end of the diverging region, as required by amended claim 1.

On page 2 of the Remarks of the present Office Action, the Examiner states that

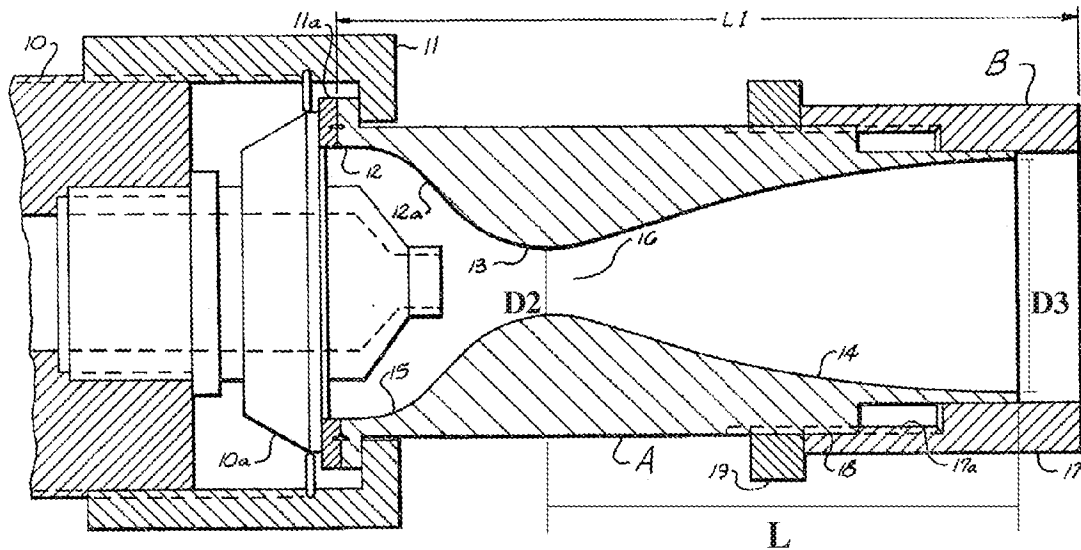
Prasthofer discloses “an expansion rate of at least 5 millimeters squared per millimeter.” (emphasis added). First, merely for clarification purposes, it should be noted that claim 1 states that “the diverging region adjacent said throat having a cross-sectional expansion rate of at least 1.0 millimeters squared per millimeter.” (emphasis added).

Further, as has been made very clear in Applicants’ Responses dated October 17, 2006 and March 30, 2007, the cross-sectional expansion rate of the diverging region required in amended claims 1, 7, and 13 is equal to the change in the cross-sectional area of the diverging region divided by the length of the diverging region. An equation for the cross-sectional expansion rate is as follows:

$$R = \frac{A_2 - A_1}{L}$$

where R is the cross-sectional expansion rate, A_2 is the cross-sectional area of the exit end of the diverging region, A_1 is the cross-sectional area of the throat, and L is the length between the exit end and the throat. The Examiner refers to the values disclosed in column 3, lines 29-36 of *Prasthofer*. Notably, the Examiner does not indicate any calculation that shows that *Prasthofer* discloses a cross-sectional expansion rate of at least 1.0 millimeters squared per millimeter, as required by amended independent claim 1

For the Examiner’s convenience, Applicant’s Attorney has supplemented Figure 1 from *Prasthofer* and has presented the supplemented Figure 1 below:



Prasthofer does in fact disclose values for D2 and D3 such that the cross-sectional area of the throat and the cross-sectional area of the exit end of the diverging region can be calculated. However, ***Prasthofer* does not disclose a value for L.** It can be seen from the equation above that **it is impossible to calculate a value for the cross-sectional expansion rate without knowing the value for L.** As such, *Prasthofer* fails to disclose a cross-sectional expansion rate of at least 1.0 millimeters squared per millimeter wherein the portion is located within a first one third of a length of the diverging region adjacent to the throat and wherein the cross-sectional expansion rate decreases between the first one third and an exit end of the diverging region, as required in amended claim 1. Because *Prasthofer* does not disclose each and every element of amended independent claim 1, *Prasthofer* does not anticipate amended independent claim 1 under 35 U.S.C. §102(b). With respect to the rejection of claim 4 under 35 U.S.C. §103(a) as being unpatentable over *Prasthofer*, this issues is not commented on further here because it is presently moot given the above analysis of claim 1, from which claim 4 depends, although Applicants do not acquiesce in the Examiner's position.

Applicants respectfully traverse the rejection of claims 1-20 under 35 U.S.C. §103(a) as being unpatentable over *Van Steenkiste '913* in view of *Prasthofer*. The Examiner states that *Van Steenkiste '913* discloses all of the featured elements of the instant invention except for a nozzle having an expansion rate of at least 1.0 millimeters squared per millimeter. The Examiner then states that *Prasthofer* discloses a nozzle having the claimed expansion rate and the use of the nozzle of *Prasthofer* would be a mere substitution of one functionally equivalent nozzle for another and any of these would work equally well in the device disclosed in *Van Steenkiste '913*.

First, the combination of *Prasthofer* and *Van Steenkiste '913* does not teach or suggest every element of amended independent claims 1, 7, and 13. As set forth above, *Prasthofer* does not disclose a nozzle having the diverging region adjacent the throat having a cross-sectional expansion rate of at least 1.0 millimeters squared per millimeter wherein the portion is located within a first one third of a length of the diverging region adjacent to the throat and wherein the cross-sectional expansion rate decreases between the first one third and an exit end of the diverging region, as required by amended claims 1, 7, and 13.

Further, with respect to the Examiner's comment that the substitution of the nozzle of *Prasthofer* in the device of *Van Steenkiste '913* would amount to the mere substitution of one functionally equivalent nozzle for another that would work equally well, this comment is moot in light of the fact that *Prasthofer* does not disclose the nozzle claimed in amended independent claims 1, 7, and 13. In other words, because *Prasthofer* does not disclose the nozzle claimed in amended independent claims 1, 7, and 13, the Examiner can not show a finding that the substituted components and their functions were known in the prior art and can not show a finding that the results of the substitution would have been predictable. *See MPEP 2143 B*. To the contrary, as discussed by Applicants' Attorney in the Responses dated October 17, 2006 and March 30, 2007, a higher expansion rate in the cross-sectional area of the diverging region, e.g., at least 1.0 millimeters squared per millimeter, leads to a dramatic increase in particle velocity using the same main gas temperature. The rapid

expansion of the portion of the diverging region causes a rapid decrease in the gas pressure and a corresponding rapid increase in the gas velocity. The rapid increase in the gas velocity is important in achieving rapid acceleration of the particles. Further, utilizing nozzles designed according to the present invention results in the increase in the deposition efficiency of particles utilizing the same main gas temperature and pressure relative to prior art nozzles. Specifically, an expansion rate of at least 1.0 millimeters squared per millimeter provides a significant benefit to the coating performance.

As the Examiner is aware, the Examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. *See MPEP 2142*. For the reasons set forth above, Applicants respectfully assert that the Examiner has not established a *prima facie* conclusion of obviousness and respectfully request the rejection of claims 1-20 under 35 U.S.C. §103(a) be withdrawn.

In view of the foregoing, it is respectfully submitted that independent claims 1, 7, and 13 and the claims that depend therefrom, are both novel and non-obvious such that these claims are in condition for allowance, which allowance is respectfully requested. The Commissioner is authorized to charge our Deposit Account No. 08-2789 in the name of Howard & Howard Attorneys, P.C. for any fees or credit the account for any overpayment for this matter.

Respectfully submitted,

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